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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BOYD, ERIN M	

ART UNIT	PAPER NUMBER
3663	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/583,626	BLAUDIN DE THE, FRANÇOIS	
	Examiner	Art Unit	
	Erin M. Boyd	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 September 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

2. Applicant argues on page 9; paragraph 2 that one of ordinary skill in the art would not have determined, through routine experimentation, that the radial clearance for assembly and passage of gas between one and two tenth of a millimeter is optimal because one of skill in the art would not have determined that the clearance size would be a result effective variable. Examiner disagrees. As applicant admits in his specification background (page 3, paragraphs 2 and 4), methods for increasing the volume inside fuel rods for expansion of gases have been explored prior to his invention. One of ordinary skill in the art would realize that increasing the clearance size between the fuel and cladding would increase the volume inside fuel rods for expansion of gases (notice also the clearance taught in Ocken, figure 2). Thus, the result effective variable would be to provide sufficient volume in the fuel rod to facilitate gas expansion (See MPEP §2144.05 (II)).

3. Applicant argues on page 9, paragraph 4 that one of ordinary skill in the art would not have determined, through routine experimentation, that the second cylindrical portion of the inner portion of the lower plug having a diameter of between 40% and

60% is optimal because one of skill in the art would not have determined that the proportions of the lower plug diameter and inner diameter of the cladding would be a result effective variable. Examiner disagrees. As applicant admits in his specification background (page 3, paragraph 2), methods for increasing the volume inside fuel rods for expansion of gases have been explored prior to his invention. One of ordinary skill in the art would realize that increasing the volume of the lower plenum would increase the volume inside fuel rods for expansion of gases.

Furthermore, unless the dimensions are critical to the invention, where the general conditions are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (See MPEP §2144.05 (II)). Applicant admits in his specification on page 13, line 25-33 that the intermediate portion (second cylindrical portion) may have any length in the axial direction which allows the end of the tubular cladding to be closed in a tight manner relative to the fist cylindrical portion and the fuel pellet column; thus, the limitation that the length of the second cylindrical portion is 8 to 10 times the diameter of the tubular cladding is not critical to the invention. In addition, if said dimension is critical to the invention, then independent Claim 6 is missing essential elements.

4. Applicant argues on page 10, lines 14-16 that it would not have been obvious to modify Bresnick in view of Ocken as Bresnick is not designed to have expansion space of gas capabilities for use with MOX. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the

primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

5. Applicant argues on page 11, lines 5-8 that the first office action on the merits asserts cylindrical body 6e is the cross member, but Hayashi discloses a support for the fuel pellets in the fuel rod which is similar to the third portion in the present invention. Examiner fails to see the point of Applicant's argument. Examiner also points out that Applicant has not presented a reason why 6e cannot be interpreted as the cylindrical body.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. Some of the omitted steps are: providing all the structure claimed in Claim 6, stacking the fuel pellets in the cladding, etc.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 3,804,710 (herein after "Bresnick") in view of Applicant's own admission.

10. Regarding Claim 1, Bresnick teaches a fuel rod for a nuclear reactor that is cooled by water, comprising a cylindrical tubular cladding 1; a column of nuclear fuel pellets 2 that are stacked one on top of another inside the tubular cladding 1 in the axial direction of the cladding; a first end plug 6 for tight closure of a first axial end of the cladding of the rod 1 arranged at a lower portion of the fuel rod when the rod is in an operating position inside the nuclear reactor, the cladding of the rod having an axis vertical (figure 1); and a second plug 7 for a tight closure of the second axial end of the cladding, the column of fuel pellets 2 resting on an inner portion of the first plug 6, referred to as a lower plug, via a first lower end, and being retained inside the tubular cladding 1 by a compression spring 5 that is interposed between a second upper axial end 4 of the column of fuel pellets 2 and an end of an inner portion of the second plug 7,

referred to as the upper plug, wherein the inner portion of the lower plug 6 engaged inside the tubular cladding 1 successively comprises, in the axial direction and in a direction from the first towards the second end of the cladding, a first cylindrical portion 13 that has a diameter that is substantially equal to the inner diameter of the tubular cladding, a second cylindrical portion 16 that has a diameter that is smaller than the inner diameter of the tubular cladding and a third cylindrical portion 14 that has a diameter that is smaller than the inner diameter of the tubular cladding and that is greater than the diameter of the second cylindrical portion 16 so that there remains, between a lateral outer surface of the third cylindrical portion 14 and an inner surface of the tubular cladding 1, a radial clearance for passage of gas and a substantially planar end surface 15 on which the first end of the column of fuel pellets 2 rests, so that an annular space for expansion of gas is formed between the outer surface of the second portion 16 of the inner portion of the lower plug 6 and the inner surface of the cladding 1 (figure 1 and 2, column 2, lines 16-60).

Bresnick fails to teach that a volume of the annular space is a function of expansion gas in the fuel rod during operation. However, on page 3, paragraph 2 of the specification Applicant admits that a conventional method of increasing the volume for expansion of the gases in the fuel rod is to provide an upper and lower plenum in the fuel rod (which is what Bresnick does (figure 1)). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to construct the annular space of a fuel rod to have a volume that is a function of the expansion gas in the fuel rod.

11. Regarding Claim 12, the limitation of Claim 12 is a necessary and required step in providing the fuel rod of Claim 1.

12. Regarding Claim 13, Bresnick teaches a fuel rod with annular space and fission gases (column 2, lines 21-24). It is inherent that gases in the fuel rod would fill annular space. Applicant also admits in his specification (page 3, paragraph 2) that a conventional method improves diffusion of the pellet gases towards the lower plenum (i.e. annular space). Furthermore, statements that are either essentially method limitations or statements of intended or desired use (e.g. "...fill the annular space") do not serve to patently distinguish the claimed structure over that of the reference, as long as the structure of the cited references is capable of performing the intended use. See MPEP 2111-2115.

See also MPEP 2114 that states:

> A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647.
>
> Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531.
>
> [A]pparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 15 USPQ2d 1525,1528.

As set forth in MPEP 2115, a recitation in a claim to the material or article worked upon does not serve to limit an apparatus claim.

The system in the cited reference is capable of being used in the same manner and for the intended or desired use as the claimed invention. Note that it is sufficient to show that said capability exists, which is the case for the cited references.

13. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 3,804,710 ("Bresnick"), as applied to Claim 6, in view of U.S Patent No. 4,046,631 (herein after "Clapham").

14. Regarding Claim 7, Bresnick teaches the fuel rod wherein the third cylindrical portion 14 of the inner portion of the lower plug 6 of the fuel rod has a diameter such that there remains, between the outer lateral surface of the third cylindrical portion 14 and the inner surface of the tubular cladding 1, a radial clearance for assembly and passage of gas (figure 1). Bresnick fails to teach that the radial clearance is between one and two tenths of a millimeter, but Clapham teaches that the radial clearance between a third cylindrical portion 7 and the tubular cladding 1 is 1.8 mm (figure 1, column 3, lines 9-10). Although neither Bresnick nor Clapham disclose the specific values for the radial clearance claimed in Claim 7, one of ordinary skill in the art is expected to routinely experiment with the parameters, especially when the specifics are not disclosed, so as to ascertain the optimum or workable ranges for a particular use. Accordingly, it would have been obvious through routine experimentation and optimization, for one of ordinary skill in the art to find that one to two tenths of a

millimeter is an appropriate/sufficient radial clearance between the tubular cladding and third cylindrical portion; and hence, design the plug/fuel rod as such.

15. Regarding Claim 8, Bresnick teaches the basic inventive features, but fails to teach that the second cylindrical portion of the inner portion of the lower plug has a diameter of between 40% and 60% of the inner diameter of the tubular cladding and a length in the axial direction of between 8 and 10 times the inner diameter of the tubular cladding. Clapham teaches that the second cylindrical portion 6 of the inner portion of the lower plug 4 had a diameter of about 18% of the inner diameter of the tubular cladding (column 3, lines 10-11). Although neither Bresnick nor Clapham disclose the specific percentage that the diameter of the second cylindrical portion 6 is of the diameter of the tubular cladding 1, claimed in Claim 8, one of ordinary skill in the art is expected to routinely experiment with the parameters, especially when the specifics are not disclosed, so as to ascertain the optimum or workable ranges for a particular use. Accordingly, it would have been obvious through routine experimentation and optimization, for one of ordinary skill in the art, to find that designing the second cylindrical portion diameter between 40% and 60% of the diameter of the tubular cladding 1 is sufficient / appropriate. In addition, applicant discloses in the specification (page 13, line 25-33) that the intermediate portion (second cylindrical portion) may have any length in the axial direction which allows the end of the tubular cladding to be closed in a tight manner relative to the fist cylindrical portion and the fuel pellet column;

thus, the limitation that the length of the second cylindrical portion is 8 to 10 times the diameter of the tubular cladding is a matter of design and not critical to the invention.

16. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 3,804,710 (“Bresnick”), as applied to Claim 6, in view of U.S. Patent No. 4,120,752 (herein after "Ocken").

17. Regarding Claim 9, Bresnick teaches the basic inventive features, but fails to teach that at least a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium. Ocken teaches mixed oxide fuel pellets 10 of uranium and plutonium (figure 2; column 2, lines 63-66). The motivation for using mixed oxide (uranium and plutonium) as fuel in the fuel rod of a reactor is to provide the necessary heat energy for a coolant flowing past the fuel rod, yet the maintaining the structural integrity of said fuel rod (column 2, lines 28-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use mixed oxide (plutonium/uranium) fuel pellets as the fuel source in a nuclear reactor.

18. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 3,804,710 (“Bresnick”), as applied to Claim 6, in view of U.S. Patent No. 4,111,748 (herein after “Hayashi et al.”).

19. Regarding Claim 10, Bresnick teaches the basic inventive features, but fails to teach that there is at least one cross-member in at least one zone of the second cylindrical portion, extending in an axial direction, the at least one cross-member constituted by a diametrically widened cylindrical portion of the second cylindrical portion that has an outer diameter that is substantially equal to the inner diameter of the tubular cladding that is reduced by an assembly clearance. Hayashi et al. teaches a lower end plug 5 / supporting structure 3e combination of a nuclear fuel rod that has a cross-member 6e in the zone of the second cylindrical portion 13, extending in the axial direction, the cross-member 6e constituted by a diametrically widened cylindrical portion of the second cylindrical portion 13 that has an outer diameter that is substantially equal to the inner diameter of the tubular cladding 2 that is reduced by an assembly clearance (figure 1 and 7b). A motivation for designing the end plug as described above is to allow the production of a series of successive breaks to thereby allow retention of relatively uniform distribution of stress in the cladding tube or at the plugged end junctures (column 2, line 64 – column 3, line 3). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to design the end plug to have at least one cross-member in at least one zone of the second cylindrical portion, extending in an axial direction and having an outer diameter that is substantially equal to the inner diameter of the tubular cladding that is reduced by an assembly clearance.

20. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 3,804,710 (herein after "Bresnick") in view of U.S. Patent No. 4,120,752 (herein after Ocken).

21. Regarding Claim 11, Bresnick teaches a fuel rod for a nuclear reactor that is cooled by water, comprising a cylindrical tubular cladding 1; a column of nuclear fuel pellets 2 that are stacked one on top of another inside the tubular cladding 1 in the axial direction of the cladding; a first end plug 6 for tight closure of a first axial end of the cladding of the rod 1 arranged at a lower portion of the fuel rod when the rod is in an operating position inside the nuclear reactor, the cladding of the rod having an axis vertical (figure 1); and a second plug 7 for a tight closure of the second axial end of the cladding, the column of fuel pellets 2 resting on an inner portion of the first plug 6, referred to as a lower plug, via a first lower end, and being retained inside the tubular cladding 1 by a compression spring 5 that is interposed between a second upper axial end 4 of the column of fuel pellets 2 and an end of an inner portion of the second plug 7, referred to as the upper plug, wherein the inner portion of the lower plug 6 engaged inside the tubular cladding 1 successively comprises, in the axial direction and in a direction from the first towards the second end of the cladding, a first cylindrical portion 13 that has a diameter that is substantially equal to the inner diameter of the tubular cladding, a second cylindrical portion 16 that has a diameter that is smaller than the inner diameter of the tubular cladding and a third cylindrical portion 14 that has a diameter that is smaller than the inner diameter of the tubular cladding and that is

greater than the diameter of the second cylindrical portion 16 so that there remains, between a lateral outer surface of the third cylindrical portion 14 and an inner surface of the tubular cladding 1, a radial clearance for passage of gas and a substantially planar end surface 15 on which the first end of the column of fuel pellets 2 rests, so that an annular space for expansion of gas is formed between the outer surface of the second portion 16 of the inner portion of the lower plug 6 and the inner surface of the cladding 1 (figure 1 and 2, column 2, lines 16-60).

Bresnick fails to teach that at least a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium.

Ocken teaches mixed oxide fuel pellets 10 of uranium and plutonium (figure 2; column 2, lines 63-66). The motivation for using mixed oxide (uranium and plutonium) as fuel in the fuel rod of a reactor is to provide the necessary heat energy for a coolant flowing past the fuel rod, yet the maintaining the structural integrity of said fuel rod (column 2, lines 28-34). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use mixed oxide (plutonium/uranium) fuel pellets as the fuel source in a nuclear reactor.

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erin M. Boyd whose telephone number is (571) 270-5378. The examiner can normally be reached on Monday - Friday 9:00-6:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/E. M. B./
Examiner, Art Unit 3663

/Rick Palabrica/
Primary Examiner, Art Unit 3663